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# Occupied with classification: Which occupational classification scheme better predicts health outcomes?

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## ABSTRACT

Health inequalities continue to grow despite continuous policy intervention. Work, one domain of health inequalities, is often included as a component of social class rather than as a determinant in its own right. Many social class classifications are derived from occupation types, but there are other components within them that mean they may not be useful as proxies for occupation. This paper develops the exposome, a life-course exposure model developed by Wild (2005), into the worksome, allowing for the explicit consideration of both physical and psychosocial exposures and effects derived from work and working conditions. The interactions between and within temporal and geographical scales are strongly emphasised, and the interwoven nature of both psychosocial and physical exposures is highlighted. Individuals within an occupational type can be both affected by and effect upon occupation level characteristics and health measures. By using the worksome, occupation types are separated from value-laden social classifications. This paper will empirically examine whether occupation better predicts health measures from the European Working Conditions Survey (EWCS). Logistic regression models using Bayesian MCMC estimation were run for each classification system, for each health measure. Health measures included, for example, whether the respondent felt their work affected their health, their self-rated health, pain in upper or lower limbs, and headaches. Using the Deviance Information Criterion (DIC), a measure of predictive accuracy penalised for model complexity, the models were assessed against one another. The DIC shows empirically which classification system is most suitable for use in modelling. The 2-digit International Standard Classification of Occupations showed the best predictive accuracy for all measures. Therefore, examining the relationship between health and work should be done with classifications specific to occupation or industry rather than socio-economic class classifications. This justifies the worksome, allowing for a conceptual framework to link many forms of work-health research.

## 1. Introduction

Health research has looked at a variety of domains of inequalities. One of these, work, has been generally neglected, though the relationship between it and health has increasingly been highlighted, particularly in terms of its psychosocial conditions (see Siegrist et al., 2010; Benach et al., 2012; Lewchuk et al., 2003; Braveman et al., 2005). The workplace psychosocial environment is generally thought to be a consequence of employment relations rather than solely of external social determinants of health (Benach et al., 2014). It is not only the work itself or the technologies around it, but the structure and order of the workplace that may create both physical and mental health effects (Canaan, 1999). Psychosocial hazards in the workplace have often been considered separate to physical ones (Karasek and Theorell, 1990), when they may be related to one another, similar to the interconnected

‘whole person’ view of physical and mental health (Carter et al., 2015). However, results from research on employment conditions and health can be inconsistent. For example, nonstandard labour contracts were not associated with adverse health effects by Scott-Marshall and Tompa (2011), but Benach and Muntaner (2007) report that those in insecure jobs have higher self-reported morbidity. Differences in results can be attributed to the diversity of the outcomes researched in terms of the forms of employment examined, the composition of the sample, which health measures are included, and the location or context of the work (see Kauskamp et al., 2013; Virtanen et al., 2005). Indeed, Hoven and Siegrist (2013) review mediation and moderation studies on adverse working conditions and health outcomes, noting that studies feature “a high degree of heterogeneity of core measurements.”

This can be exacerbated as the difference between some of these measurements and contexts used in studies may be unclear (e.g. part-

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time work hour thresholds), and new forms of work, such as flexible employment, can be difficult to classify, particularly with respect to terminologies which may be unclear; temporary, non-permanent, precarious, non-standard, insecure, contingent, fixed-term, atypical, casual, and unregulated represent similar concepts in various studies (Peck, 1996; Kim et al., 2012; Kauskamp et al., 2013; Benach and Muntaner, 2007; EMCONET, 2007; Scott-Marshall and Tompa, 2011). A variety of perspectives have sought to address inconsistency in this field: two of the most commonly used schemata of the work-health relationship are the job strain or job-demand-control model (Karasek and Theorell, 1990) and the effort-reward imbalance model (Siegrist, 1996). Benach and Muntaner (2007) suggest that these frameworks, though, may not be able to incorporate “more distal social and organizational determinants of health.” This paper will bring new perspectives in to bear on issues with these conceptual models, in order to take into account structural and social inequalities, geographical context, and time. Looking towards the life-course approach and through the lens of exposure, a framework linking concepts in epidemiology, occupational health, and inequalities research has been developed – the worksome.

## 2. Background

Health research can sometimes confound occupation and class, often by using either as a proxy for the other (Shaw et al., 2000). That is to say, occupational classifications are sometimes used as class and vice versa (see Clougherty et al., 2010), but class is more complex than just occupation, and this is reflected in how class classifications are created (see ONS, 2010). Occupation is a component of class, and occupation is simply the job or work someone does; class is, in essence, a hierarchical measure of socioeconomic positioning, and on a higher scale, a measure of social structure. Savage (2015, p35) asserts that occupationally-based measures of class are “actually a way of making for cultural judgements about the ranking and social importance of jobs.” MacDonald et al. (2009), in a review of epidemiological studies, found that while many collected occupational measures, most work used these data to inappropriately represent socioeconomic class. Class is almost always unsuitable to examine the work-health relationship as it has historically been articulated in a variety of ways. Class contains an implied hierarchy, which already imposes a relationship that may be unsuitable and inappropriate. Further, with class, it is difficult to understand axial differences (e.g. skilled versus unskilled white and blue-collar workers). Using occupation as a proxy for class or vice versa can mask the nuances between or within occupations with respect to working conditions and exposures. Occupation can indeed be articulated as part of a class definition, but it is not simply a component of it; it can be a social determinant of health in its own right.

While work such as the Whitehall studies (see Clougherty et al., 2010) have created the basis for examining the relationship between work and health, it is important to remove implied hierarchies or grades of occupation to discover further information about these relationships. It is important to remove implied hierarchies or grades from occupation to discover further information about these relationships, in addition to the evidence on social class gradients of health. There has been a vast array of research into employment status, or grade and health (e.g., Marmot et al., 1991; Benach et al., 2014; MacDonald et al., 2009; Mackenbach et al., 2008), but with a changing world of work and employment relations, precarious or ‘flexible’ conditions are filtering through to jobs where it would have been inconceivable before. Socioeconomic characteristics like class may interact with flexible working conditions vis a vis health outcomes, but reflecting on the percolation of these conditions to other jobs, refined occupational categories change less over time, and may be more appropriate (see Benach et al., 2014; Hoven and Siegrist, 2013). Daykin (1999) argues that changing patterns of employment, generally thought to be a consequence of the late 20th century neoliberal shift, are

reflected in new patterns of the production and distribution of risk and hazard, namely the transfer of the costs and risks of employment from the employer to the employee (see also Standing, 2011; Kim et al., 2012). Flexibility is not just found in the technical systems of work, but also more abstract elements thereof, such as tasks, status, and scheduling (Ross, 2009; Benach and Muntaner, 2007). It also has filtered through to work where these conditions may have once been thought unthinkable. In general, work has also been intensified with a pressure to do the same or more work in less time, or to expand tasks and expectations beyond what they were before (McNamara et al., 2011). These conditions are not equally distributed amongst occupations, and perhaps even individuals, so it follows, then, that inequalities in health should be also examined occupationally.

Clougherty et al. (2010) assert that “occupational classifications used in many epidemiological studies (i.e., manual/nonmanual distinctions, professional grade, and census job classifications) have proven too coarse to capture fine-scale status differences [...]”. Sometimes, for example, there is a lack of clarity: Hallerod and Gustafsson (2011) argue that occupations can be used to create ‘economical classes,’ but occupation only forms part of these classes. Moreover, Hallerod and Gustafsson (2011) use ‘occupational position’, ‘employment position’, ‘economical classes,’ and ‘social classes’ almost interchangeably, possibly based on that argument, which can lead to some confusion when it comes to interpreting results. The UK NS-SEC (National Statistics Socio-Economic Classification), for example is generated with the UK version of the ISCO 2008, the SOC2010, but it contains other inputs relating to status (ONS, 2010). For example, Corna and Sacker (2013) convert from the SOC1990 to the NS-SEC to assign ‘occupational class,’ and refer to it as such, when the SOC codes are themselves an occupational classification. The European social class measure for the European Social Survey is composed in a very similar fashion from multiple items, including occupation (Erikson and Jonsson, 2001; Almeida et al., 2006). Almeida et al., 2006 claim that “class structures significantly mark the value patterns found in the populations analysed.” We assert, then, that using class can also limit the transferability of results due to variation in contexts. Occupations, while socially mediated, are not, like class, socially defined, and are more readily conceptually transferable between contexts.

Different occupations are associated with varying conditions, risks, prospects, and outcomes, these are not given across or even within occupations. There is thus considerable heterogeneity within and between occupations. Therefore, the relationship between working conditions and health should be analysed with respect to this heterogeneity, looking both between and within occupations. As such, the hierarchy implicit in class classifications may confound the examination of these already complex relationships.

To that end, this paper will examine several classification systems empirically, namely ISCO as an occupational one, NACE as an economic/occupational system, and NSSEC as a socioeconomic class one, as it is commonly used in the literature, to provide a base for using occupational classifications over socio-economic class ones by determining which classification has the best predictive accuracy with respect to a range of health measures from a specifically occupational dataset. Further, it will argue that finer-scale versions of these classification systems perform better in general even when parsimony is considered. This will also forward the worksome framework by empirically demonstrating that occupational classifications are the most appropriate for work-health research, when often class is used to proxy occupation or vice versa, which is not always the right approach. There is therefore a need to bridge what people are exposed to and what people say or believe they are exposed to, including social exposures. This paper will introduce the worksome in order to provide a framework for justifying the use of occupational classifications over class, and the importance of occupation as a social determinant of health. The worksome will be underpinned empirically by an examination of occupational, social, and economic classification systems.

### 3. Theoretical framework: the worksome

The worksome is an expansion of the exposome. The exposome was developed by Wild (2005) in response to the sequencing of the human genome, and to incorporate the life-course approach (see Ben-Shlomo and Kuh, 2002) to exposure into epidemiology. The exposome includes three separate-but-overlapping domains, the internal, specific external, and general external (Wild, 2005, 2012) whilst also capturing both nature and nurture (Miller and Jones, 2014). This sort of life-course approach is appropriate for work (which we can define as a ‘general external’ element) as it accounts for a large proportion of time in a life-course (Bambra, 2011; Payne, 1999; Peck, 1996), and it can impact how lives are lived outside the workplace (Kleiner and Pavalko, 2013). Working consumes a large part of any life course, regardless of whether it is formal or informal. The general external elements, like work, of the framework are, in the general version of the exposome assumed rather than measured, as work with the exposome is predominantly top-down, focusing on physically measurable exposures (Rappaport, 2011). The exposome has been adapted for health inequality research, notably by Juarez et al. (2014) who created ‘the public health exposome,’ which focuses primarily on environmental health. Research creating various types of exposome, for instance see the exposomics project (see Vineis et al., 2017), the public health exposome (Juarez et al., 2014), and the occupational exposome (Faisandier et al., 2011), focuses on the use or adaption of the exposome more with respect to biological analyses and issues which may arise thereof, without realising that other approaches using survey data may also be suitable under the paradigm (Brunekreef, 2013).

The worksome expands on the idea of exposure to include a social-physical gradient (see Fig. 1). It is necessary to consider work explicitly to draw out lower-level scale (micro/meso) exposures, vectors, and effects. The worksome emphasises the importance of the scale of exposure and the interactions both within and between scales. Scale, used here in the sense of ‘level’, can include individuals, work groups, firms, industries, and so on, with other geographic and contextual

(geocontextual) factors existing at the same or different levels, such as the workplace, the city, or the regulatory regime at varying levels of government. This does not mean that scales are rigid. Delaney and Leitner (1997), argue that scale is often constructed, and so the worksome takes scale as a fluid, *interactive* concept of levels, while keeping in mind that scale is often socially and politically mediated. The physical-social aspects of exposure are represented by the social gradient linking the physical to the geocontextual and the workplace, in order to encompass largely physical exposures (such as chemical handling, see for instance Arif and Delclos, 2012), predominantly social exposures (including social support, see Niedhammer et al., 2012), and exposures which are inherently both physical and social and fall between the extremes, such as working time (see Dembe et al., 2005; Kivimäki et al., 2015) (see Fig. 1). Working time is both; as a basic concept, it is physical: the time spent exerting oneself at work, but it too is social, in the sense that it is also the time spent being exposed to a variety of (physical and social) working conditions. Social exposures have a certain intangibility to them, something which is emphasised in the social-physical gradient of the worksome, though it is an exposure type not emphasised by the exposome. A social-physical gradient of exposure allows for flexibility in analysis as it provides a framework within the worksome for disparate and similar-but-different measures of exposure to be compared. Moreover, individual-level exposures and workplace level exposures interact: individuals within a workplace are affected and effect upon workplace-level characteristics. Individuals, therefore, cannot be considered solely as discrete entities with respect to the work-health relationship. There are also factors above the individual and the workplace.

Workplaces are also located within geographical contexts, be it in relation to other firms, related industries, as well as in social and regulatory contexts. Geocontextual influences are an undercurrent and require consideration in work-health research. Time is also considered in the worksome – exposures continue across the life course. Again, interactions within and between all of these domains must be emphasised – people exist at multiple scales simultaneously: ‘echoes’ of past actions or consequences are reflected in these interactions as well. A given individual's contribution can prevail and the residual impacts remain with people for a long time after the initial exposure, as well as influencing their and others' behaviours. By including the interactions between scales, individuals, times, and geographies in the worksome, we further our understanding of the complexities of this landscape. As work too consumes a large part of any given individual's life, the life course approach is key to understanding work as a social determinant of health. With respect especially to time, the life trajectory approach allows the worksome to also cover those who are unemployed or engaged in informal work. The former is incorporated as they move in and out of the workforce. The latter is encompassed as the worksome does not distinguish between formal and informal work, in the sense that they are both considered equally under the framework. Indeed, there are a number of papers examining life trajectories and career typologies with respect to occupational mobility, for example, and these approaches, often using sequence analysis or latent class analysis, can and should be emulated in work that examines the relationships between working conditions and health (Haapakorva et al., 2017; Anders and Dornett, 2017; Scott and Zeidenberg, 2016; Corna and Sacker, 2013). Movement between occupation types, such as from manufacturing to the low-paid service sector, has been connected with poorer health using these approaches (Kampanellou and Houston, 2016). Employing latent class models, Corna and Sacker (2013) modelled the lifetimes of older British adults, particularly around the labour market and family experiences, finding significant differences in the mental health domain. The worksome is useful over the exposome as it adds specificity and interaction between the domains, has a social-physical exposure gradient, and emphasises scale more strongly.

Both qualitative and quantitative forms of research are key to forming a better picture of the work-health relationship. Within the

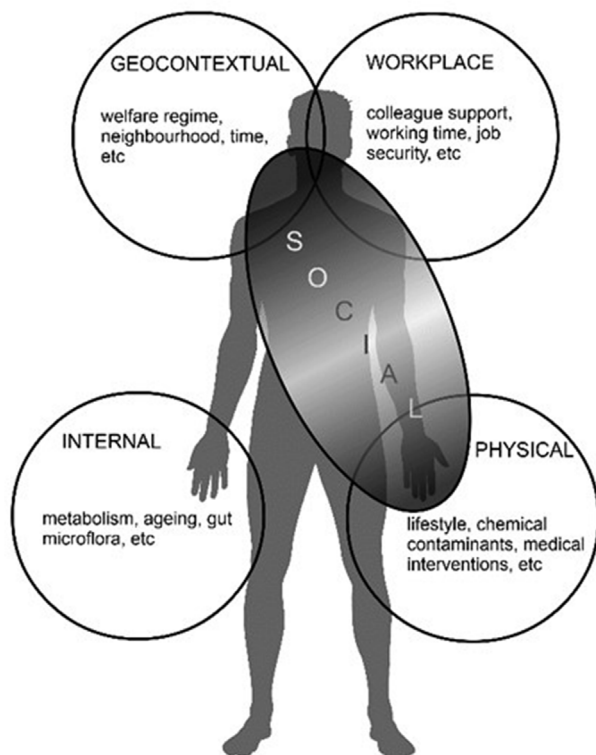


Fig. 1. The worksome.



quantitative approaches multilevel models can be used to approximate the proposed structures (see [Hox, 2010](#)). For qualitative research, the effects people have on systems and scales and how they are affected by them could be elucidated through interviews, or participatory work where the participants guide the research journey.

Using the language of biomedical epidemiology is key to this approach; the goal is to not only forward a more clear and comparable set of social research projects but also to develop clearer research findings for policymakers and other scientists. The worksome makes explicit the elements that the exposome treats as givens, allowing for the use of language familiar to policymakers while including effects that may not be considered explicitly in the biomedical approach. This framework can help fit disparate pieces of research together and contextualise them to form a wider collective of research. Flexibility is important, as for research involving people, a complete body of research is impossible as society is constantly changing, so gaps in research are to be expected, and can be filled.

For the empirical portion of this paper, the objective is to distinguish work, or occupation, from class, and to set out which system of classification is most appropriate for use in quantitative analysis. This will advance the argument that occupation and class should be examined separately, as well as supporting the usefulness of the worksome in underpinning work-health research. This will use the European Working Conditions Survey to see which classification system has the best predictive accuracy for a variety of health measures including backache, self-rated health, and fatigue.

## 4. Methods

### 4.1. Data

The European Working Conditions Survey (EWCS) is a repeated cross-sectional quinquennial survey started in 1991. It is administered by the European Foundation for the Improvement of Living and Working Conditions (Eurofound) for the European Union (EU). Waves were conducted in 1991, 1995/6, 2000/1, 2005, 2010, and 2015. This paper uses data from the 2010 and 2015 waves, due to the presence of occupational class variables. All EU countries and European Economic Area (EEA) countries were included, with a number of EU candidate members in some waves, therefore not all countries are in all waves ([Eurofound, 2015](#)). The target sample in each country was between 500 and 1500 individuals. The EWCS data were obtained from the UK Data Service ([Eurofound, 2017](#)). The EWCS data has individuals classified both by the Statistical Classification of Economic Activities in the European Community (NACE) and the International Standard Classification of Occupations (ISCO). The NACE is an industry classification, and the ISCO an occupational one. The National Statistics Socio-Economic Classification (NS-SEC) is a British system of socio-economic classification based on the UK occupational classification system (SOC2010), employment status, and firm size ([ONS, 2010](#)). The SOC2010 was derived from the ISCO 2008 2-digit version, and the employment status and firm size variables were derived from survey questions in the EWCS.

A new dataset was created with the occupational classifications and relevant health measure variables (see [Table 1](#)) for the years 2010 and 2015. Only 2010, 2015 were included as the expanded 2-digit ISCO and NACE classifications were only in those waves ( $n = 81115$ ). In the analysis the data for 2010 and 2015 are combined as this study is not concerned with change and it means that there is a larger sample size to detect meaningful effects; the classifications and outcome variables were consistent over this relatively short period. The health measure variables were dichotomised in order to fit the logistic regression model. The original responses were ‘Yes, positively’, ‘Yes, negatively’, and ‘No.’. [Manor et al., \(2000\)](#) found in their analysis of self-rated health that both dichotomised and ordered categorical models showed similar results with only small differences in power and efficiency. The

**Table 1**

Health measures to be modelled and classification systems.

Health Measures	
Work-effect on health	Yes
Self-rated health	39%
In the last 12 months ...	Good: 77%
Skin problems	7%
Hearing problems	6%
Backache	45%
Muscular pains in lower limbs	33%
Muscular pains in shoulders, neck and/or upper limbs	44%
Anxiety	13%
Fatigue	41%
Headache and eye strain	39%
Injury(ies)	7%
<b>Classification Systems</b>	
NS-SEC Analytic Groups, 8 categories	
NACE Revision 2 Letter groups (1 character), 8 categories	
ISCO 2008 Major groups (1 digit), 10 categories	
ISCO 2008 Sub-major groups (2 digit), 42 categories	
NACE Revision 2 2 digit groups, 88 categories	

health measure variables are also self-reported, which may not be ideal. [Miilunpalo et al. \(1997\)](#) assessed subjective measures of health, and found that, in relation to objective health measures, they are valid for use in population health research. They also argued that perceived health measures were stable due to a small rate of major changes in that status ([Miilunpalo et al., 1997](#)). [Burstrom and Fredlund \(2001\)](#) found a strong relationship between poor self-rated health and mortality, implying that self-rated health is a suitable predictor of mortality, and therefore ‘a useful outcome measure.’ [DeSalvo et al. \(2005\)](#) found that, compared to multi-item measures of self-reported health and comorbidity, a single-item measure is as good at prediction. It is therefore acceptable, then, to use the health measures collected in the EWCS, to examine them in relation to working conditions, or, in the case of this paper, to see which classification system better predicts them.

Given the argued importance of time for understanding the worksome, specific health problems were defined to look at issues that had occurred within the last year while the general measures were defined contemporaneously at the time the questionnaire was answered.

### 4.2. Models

60 Logistic regression models were run using MLWiN 3.01. Logistic regression is used here as the measures are binary (yes/no, or good/bad). Separate models for each health measure as the independent variable ( $n = 12$ ) with each classification system ( $n = 5$ ) as dependent variables were run using a Markov Chain Monte Carlo (MCMC) Bayesian framework (see [Browne, 2015](#)). This provides a Deviance Information Criterion (DIC), a Bayesian version of the Akaike information criterion (AIC). The DIC is a measure of predictive accuracy that is the badness of fit between the observed and modelled measures penalised for model complexity ([Spiegelhalter et al., 2002](#)). The number of categories in any given system should not be a factor in determining which model has the best predictive accuracy as the DIC operates by estimating model complexity (the so-called degrees of freedom consumed in the fit) and automatically penalizes models that do not show an improvement in the badness of fit over and above model complexity; that is, it the DIC privileges parsimony. As such it is an ideal procedure for comparing models with different specifications involving different classifications. The DIC can be compared within the same health measures, but not between health measures, i.e., the DIC for the NS-SEC for skin problems cannot be compared to the DIC for backache for the ISCO 1-digit system. In terms of the specifics of MCMC estimation we followed the good-practice recommendation of [Draper \(2008\)](#). Thus, we use likelihood approach to estimate an initial model, specify default

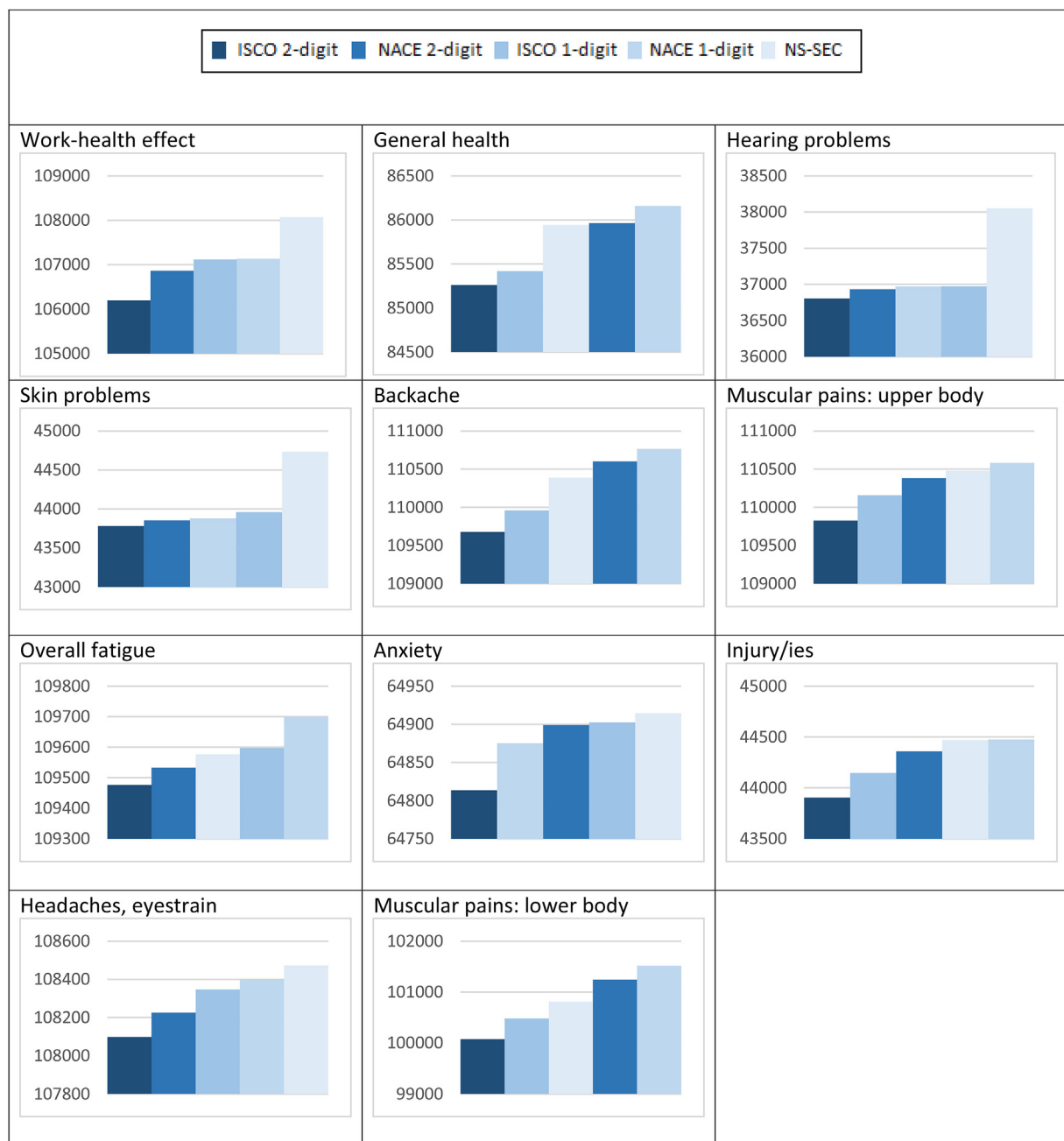


Fig. 2. DIC, a measure of model fit, by health measure. A smaller DIC indicates better predictive accuracy. For a fuller description of the outcomes, see Table 1.

priors to impose as little information as possible on the estimates, a burn-in of 500 simulations to get away from these initial (potentially poor) estimates, and a monitoring chain of some further 5000 simulations to characterise the parameter estimates and calculate the DIC.

## 5. Results

Fig. 2 presents the results of all 60 models, by question or health measure and the classification scheme. Only the DIC for each model measure/classification pair is reported. Each outcome has the individual classification models sorted by DIC, so that the classification system with the best parsimony (lowest DIC) is on the left. The colour on the graph is consistent for each system. The y-axes of the graphs are different due to the varying measures, as discussed earlier, but the comparison of classification systems should be considered *within* a measure rather than *between* a measure. It is not the specific value of

DIC which is important, but which has the lowest DIC within a measure.

The ISCO 2-digit schema best predicts whether an individual's work may affect their health. Indeed, the ISCO 2008 2-digit classification has the highest predictive accuracy for all health measures across the data, not only for those questions which referred to the work-health relationship specifically. The 2-digit NACE classification outperformed the 1-digit ISCO 2008 for some outcomes, though for self-rated health, backache, lower muscular pain, upper muscular pain, and injury it was surpassed by the 1-digit ISCO. The 1-digit ISCO, therefore, did not always perform as consistently as the 2-digit version of the classification. The NS-SEC in this study borrows some predictive power from the ISCO 2-digit classification in this dataset as it is partially derived from it, and this may be why NS-SEC showed higher predictive accuracy than both the 1- and 2-digit NACE classifications for backache and lower muscular pain, as well as over the 1-digit version of the NACE for upper muscular pain and injury. The NS-SEC also had somewhat higher predictive

accuracy over the 1-digit ISCO and 1-digit NACE in terms of fatigue. It seems then, that the NS-SEC may be slightly better at predicting measures relating to general or muscular health than the NACE. Nonetheless, the ISCO 2-digit classification remains the most empirically appropriate for predicting health measures in the EWCS dataset, as it had the lowest DIC for all health measures. Theoretically, this indicates that work should be considered separately from class when examining health measures, and that the worksome is an appropriate model for enquiry into this relationship.

## 6. Discussion and conclusions

There is a clear need to focus both theoretically and empirically on work and occupation in and of itself rather than as a component of class or a feature that can be proxied by class. While many socio-economic classification systems, like the NS-SEC do use occupation as their base, they are not a ready substitute for occupational classifications themselves. Furthermore, class contains an implied hierarchy, something which may confound results, as it is a hierarchical system of social or cultural value partially based in occupation. Social classification systems are informed by their social contexts, as the cultural value of occupations change through time. For example, around a quarter of occupations in the UK Registrar General's Class Classification changed between classes from 1951 to 1961 (Liberatos et al., 1988). A system with an implied hierarchy may not be appropriate for occupational research, particularly with a changing world of work where flexible or precarious conditions have filtered even to 'standard' occupations. Further, some occupational classification schemes (such as manual/non-manual) are too simple or coarse to examine fine-scale detail in terms of health measures (Clougherty et al., 2010), and it has been shown that the 2-digit level of the ISCO 2008 performs better. This means, then, that occupation, and therefore, the worksome, is conceptually valid as a separate and distinct social determinant of health. Theoretically, the expansion of the exposome into the worksome provides a framework for both qualitative and quantitative work.

Empirically, the analysis in this paper has shown that for examining the health of workers (through the European Working Conditions Survey), occupational classifications such as the ISCO are generally the most appropriate. The more detailed 2-digit level provides better predictive accuracy, whereas the 1-digit levels may be more practical for certain analyses and data collection practises. However, some issues remain with the 1-digit ISCO when it comes to predictive accuracy for certain health measures, where it is outperformed by the NACE 2-digit classification. In some cases, the NS-SEC did not have the least predictive accuracy compared to the other systems, primarily the NACE. One reason for this could be that the SOC2010, used to derive the NS-SEC, in the case of this data, was derived itself from the ISCO 2008 2-digit version, and therefore could have borrowed some statistical power from the ISCO 2008 2-digit. Another could be that the NACE is a classification of industries or economic activities rather than occupations and may not be completely suited to this sort of analysis. The NACE, though, is formed so as not to distinguish by the ownership, legality, modes of operation, or formality of economic activities (Eurostat ND). This may be nonetheless helpful, as the EMCONET (2007) research agenda includes non-standard forms of work beyond precarious or flexible work, including informal work and slavery. The worksome too allows for non-standard forms of work. The ISCO, for example, does not necessarily have provisions for these, so in those cases, the NACE may be more appropriate depending on the nature of the work. The ISCO 2008 2-digit version nonetheless does allow for the vast majority of occupations to be classified as it does not discriminate by conditions, so therefore flexible and modern working conditions can be accounted for as long as they are acknowledged explicitly in the study.

For clarity in research, especially when interested in either class or occupation, it is necessary to separate out class and occupation as

determinants of health. This rationale supports the use of the worksome, a conceptual framework developed in this paper, for the examination of the work-health relationship. The 2-digit ISCO 2008 occupational classification is the most appropriate when examining the relationship between work and health, compared with the NACE and NS-SEC. Therefore, there is also empirical justification for the use of the worksome as a framework, and examining occupation as a separate domain of health inequalities and as a separate determinant of health.

With both empirical and theoretical justification, the worksome therefore can provide a transferable framework for research into work and health. Through its flexibility, it can accommodate research from a variety of scales and contexts, allowing for the conceptual linking of disparate yet related studies. It is an expansion of a familiar concept, the exposome (Wild, 2005, 2012), and encompasses a life-course approach, as work is something which generally consumes a large part of any given individual's time. The exposome was explicitly chosen as a base, as its biomedical language and approach is well understood by policymakers. The worksome reorients the way in which the relationship between occupation and health is understood – as an interactive, multi-scalar framework of exposures set along a social-physical gradient (see Fig. 1). By integrating scales, times, individuals, and geographies and their interactions, the complexities of these relationships become clearer. Separating occupation from class, and justifying it empirically, is necessary to forward the worksome, as occupation is at its core. Again, as class is defined through sociocultural values, this makes it less suitable for examining the relationship between work and health, especially compared with more refined, less time-variant occupational classifications. This is not to say that there should be no research on class and health, but merely to allow for a more thorough and empirically appropriate interrogation of the complex relationship between work and health.

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